



Development of criteria for ecological evaluation of private residential lots in urban areas



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ABSTRACT

Single-family residential sector comes to the forefront in consideration of inefficient land use in urban areas. A lack of legislation, planning and evaluation reflects negatively on urban ecosystems, environment, natural balance and quality of life, and contributes to land deficiency. On the other hand, conditions on wider location and lot itself play significant role in achieving good ecological quality of residential unit and, further, of urban area in general. Formation of criteria for ecological evaluation of urban residential lots was proposed as a solution to this duality, and methodological path leading to criteria development was described. General methodology was then applied on two examples: cities Belgrade and Ljubljana, and resulting criteria were established for both. Local specificities manifested in variations among two proposals. Oppositely, common issues allowed the application of criteria in both cases. Beside the fact that evaluation systems designed for local level tackle local problems in the most comprehensive way, comparison showed that, while it is possible to apply criteria developed for Belgrade area in Ljubljana case, there exist major constraints in the immediate application of criteria proposed for Ljubljana area in Belgrade case, due to significant variations in reached overall (sustainable) urban development level.

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1. Introduction

Land has always been fundamental good, essential for life on Earth. It also is a natural and cultural environment for human activities and the element of cultural landscape and natural heritage [1]. In urban, human-dominated landscape [2], land represents a scarce resource. The characteristics of land use in today's cities, as authors describe in [3–6], are dominated by dispersed urbanization, extensive monoprogramming areas, fragmented habitats, and consequent environmental, social and economic problems: high consumption of resources, environmental pollution, suburbanization, inefficient mobility, high cost of public infrastructure, social stratification, etc. Inefficiency in urban development and uncontrolled growth of cities are often connected with urban sprawl—physical pattern of low-density expansion of large urban areas, mainly into surrounding agricultural areas [7]. Chin [8] identified four types of definition of sprawl, in terms of urban form, land use, impacts and density. Definitions based on land use tend

to associate sprawl with spatial segregation and extensive mono-purpose for single-family residential developments, freestanding shopping malls and industrial or office parks [9].

Single-family residential sector occupies large areas of valuable urban land; the type is considered as inefficient and ecologically problematic. Private lots, however, take part in formation of urban landscape and may also be observed as places “that serve community needs or hold opportunity for land use transformations which can contribute to community development and provide ecosystem services that support the health and wellbeing of people” [10]. “The development of different types of ecosystems on vacant land and the ecosystem services they could provide greatly depend on environmental conditions of the land, surrounding natural habitats, current and historic uses of the lot and the management practices utilized” [11]. “A major driver of the type and quantity of ecosystem services in urban areas is landcover. Land covered by vegetation and bare soil is generally more productive in the generation, regulation and support of ecosystem services than non-vegetated and impervious surfaces” [10].

Houses, just like other built types, make numerous impacts on their physical surroundings, environment, humans and other living species. Ecological evaluation enables mitigation of these impacts and contributes to the environmental protection. Sustainable, green or ecologically friendly single-family house is not just

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the physical structure itself; it also encompasses qualities of the house lot – its location, terrain and soil characteristics, infrastructure amenities, design and development, landcover, etc. Overall ecological assessment therefore starts with the ecological evaluation of a lot – a measured parcel of land with determined boundaries, intended for urban single-family house construction and use.

To conduct ecological evaluation of a residential lot, it is necessary to follow defined criteria. Defining the methodology for criteria establishment, therefore, represents the initial necessary step. In order to demonstrate the application of proposed method to the specific area, two case studies will be presented: city of Belgrade, capital and the largest urban area of Republic of Serbia, and wider, in the territory of former Socialist Federal Republic of Yugoslavia, and city of Ljubljana, capital and the largest urban area of Republic of Slovenia which in the past also belonged to ex-Yugoslavia, and today to European Union.

2. Single-family residential sector in ex-Yugoslavia

The specificity of urban dynamics in Eastern Europe, including the countries of ex-Yugoslavia, was caused by the absence of market mechanisms, collective ownership of urban land and infrastructure, centrally planned allocation of resources, and the existence of comprehensive settlement planning strategies as instrument of regional development [9]. Today's apparently "chaotic" settlements pattern in ex-Yugoslavian suburbia and countryside is the consequence of political, social and economic conditions and changes that were taking place for fifty years of post World War II period. Ideological orientation of the communist movement after the war gave absolute priority to collective society and interests. In physical planning, social housing construction was favored; uniform models and standards were predominant both for large urban agglomerations and rural areas that were left to pre-structuration in agrarian economy and accompanying socio-demographic restructuring. Legislation was scarce all until 1967, when the first Act of urban and regional planning, intended at beginning for municipal level, was brought. The document was a guideline to urban development, while the treatment of spatial dispersion of single-family houses in extra-urban areas, including urban periphery, had been avoided. Only since the 1970s, the typology of detached "private houses" in urban areas started to develop; this process came with the awaken individuality. During the last 20 years, the term "private house" became a synonym for new, enhanced way of life. In 1988, when the expansion of single family residential rector was already very obvious, Ivanšek wrote: "Free-standing house is the type of house which gives to the designer and the tenant relative maximum individual freedom". But, the same author further argues the constrains of that time building practice, noting that the freedom of tenants in small lots is jeopardized and that "it is usually possible to make use of place only in the case where the distances are large enough to permit the individual houses such large distances that fall off all the visual and acoustic deficiencies" ([12], p. 99), by which unconsciously encouraged low residential density.

Many single-family houses, built after the 1970s across the territory of ex-Yugoslavia, today are evaluated as: "disturbing", "of poor quality", "oversized", "in the form of cubes", etc. Objective value system, which could be used to assess the type, is still not developed. Most of these structures are on exposed locations, without any relations to natural, spatial and other restrictions. Another, newer type, so-called "one-family standard house", rarely considers the complexity of interrelations with surroundings, as well. The same relates to so-called "weekend house", built in the past in the city's periphery as a symbol of life standard, and today giving a common image of degraded and unused structure. Between these

extreme examples, there exist the significant number of houses which rose together with major changes of socio-economic conditions over the last several decades and which caused obvious, mostly negative changes in cityscape. These single-family houses were built without construction permit; instead of seeking the ways to improve spatial, ecological and life quality in general, their owners today are led by motive of "how to legalize it". The problem is especially emphasized in peripheral and edge areas of cities of ex-Yugoslavia. Uniformity of pattern also took away personal, "this-is-my-house" identity from individual who now is trying to find it by gluing "kitschy" details and weird elements on his residence.

Despite the past, today's increasing focus is on the design developed in line with location characteristics: relief, climate, vegetation, natural transitivity of the area, hydrology, stability of the ecological system and a solution to contemporary issues and to spatial organization, new construction technology, materials, new forms of dwelling culture and similar. New settlement patterns must surpass present wild growth of sprawl urbanization and replace it with appropriate structuring of new buildings in urban cores, i.e. new spatial forms developed in relation to the existing built structure, cultural landscape and cityscape. To evaluate location on which a house will be built is the first step in successful integration.

3. Methodological approach to criteria development

Development of criteria for ecological evaluation of private residential lots in urban areas depends on following determined factors:

- General guidelines for the achievement of minimally negative or even positive ecological conditions,
- Environmental impact of single-family houses,
- Adopted legislation/land use policies, and
- Characteristics of an urban area in which the evaluation will be conducted.

Conditions existing on wider location and project lot play significant role in the achievement of good ecological quality and in criteria derivation, as well. These conditions refer to: climate and microclimate; terrain and relief; soil content and quality class; air and noise pollution; pollution sources and their distance to the subject lot; waterways, water supply and water quality; potential for renewable energy use in situ; vegetation; animal species, populations and habitats; infrastructure; state inherited from previous use of the lot; links with the public transportation and other [13]. On the other hand, a designed house will, through the phases of its life cycle and in different ways and scales, make impact on the lot and surroundings.

In regard to the phases Preparation for Construction, Construction and Demolition/Renewal, lot evaluation subjects should be related to: treatment, including protection of existing vegetation; scope of land use and planned works; protection from erosion, stormwater and harmful materials, and construction waste.

Phase Use and Maintenance includes potential impacts directed from house to the lot (and its surroundings) and from lot towards the house. Additionally, the phase implicates significant issues originating from conditions on a lot and on wider location, that influence overall ecological quality of a house. For example, quality of indoor environment, and especially air and acoustic comfort, depend on outdoor air and noise conditions. Energy use correlates with urban energy infrastructure and the potential for renewable sources use on site; water use correlates with green space watering demand and with the selected plant species. Lot land use can be evaluated through house footprint, open hardscape areas and through the ratio between hardscaped and total lot area.

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